

## S.7 Cumulative Impacts of the Proposed Action

DOE evaluated cumulative short-term impacts from the construction, operation and monitoring, and closure of a geologic repository at Yucca Mountain, and cumulative long-term impacts after repository closure. It also evaluated cumulative impacts from the transportation of spent nuclear fuel and high-level radioactive waste to the repository, including those from the construction and operation of a branch rail line or of an intermodal transfer station and highway upgrades for heavy-haul trucks.

An assessment of the environment around the Yucca Mountain site included the cumulative impacts of past and present actions in the area the Proposed Action would affect. Reasonably foreseeable future actions include the disposal of inventories of spent nuclear fuel and high-level radioactive waste that exceed the Proposed Action inventory of 70,000 MTHM, along with other Federal and non-Federal actions at the Nellis Air Force Range and the Nevada Test Site, DOE waste management activities, a private space launch facility, and a private intermodal transfer station, and private mineral and energy projects.

### CUMULATIVE IMPACTS

A cumulative impact is “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (Council on Environmental Quality Regulations, 40 CFR 1508.7). Cumulative impacts can result from individually minor but collectively potentially significant actions that occur over time.

DOE could not reasonably predict future actions for the indefinite future. For that reason, DOE did not attempt to estimate cumulative impacts beyond about 100 years with the exception of impacts of radioactive materials reaching the groundwater and resulting in potential impacts to the public.

### S.7.1 INVENTORY MODULES 1 AND 2

Section 114(d) of the Nuclear Waste Policy Act provides that the maximum amount allowed to be disposed of in a first repository until a second repository is in operation is 70,000 MTHM of spent nuclear fuel and high-level radioactive waste. Comments that DOE received from the public during the scoping process for this EIS expressed the concern that more spent nuclear fuel and high-level radioactive waste would be generated than the 70,000 MTHM accounted for in the Proposed Action. In response to these comments, DOE evaluated the emplacement of the total projected inventory of commercial spent nuclear fuel and DOE spent nuclear fuel and high-level radioactive waste (Inventory Module 1) and emplacement of that total inventory plus the inventories of commercial Greater-Than-Class-C waste and DOE Special-Performance-Assessment-Required waste (Inventory Module 2).

The emplacement of Inventory Module 1 or 2 at Yucca Mountain would require legislative action by Congress unless a second repository were in operation. In addition, the emplacement of commercial Greater-Than-Class-C and DOE Special-Performance-Assessment-Required wastes could require either legislative action or a determination by the Nuclear Regulatory Commission to classify these materials as high-level radioactive waste.

The emplacement of Inventory Module 1 or 2 would increase the size of the subsurface repository facilities and, thus, the amount of land disturbed. In addition, because more time would be required to emplace more materials (an additional 14 years for emplacement and perhaps another 6 years for closure under the lower-temperature repository operating mode) emplacement of Inventory Module 1 or 2 would

## INVENTORIES

### Proposed Action

- 63,000 MTHM of commercial spent nuclear fuel
- 2,333 MTHM of DOE spent nuclear fuel
- 8,315 canisters of DOE high-level radioactive waste (equivalent of 4,667 MTHM)

### Inventory Module 1

- 105,000 MTHM of commercial spent nuclear fuel
- 2,500 MTHM of DOE spent nuclear fuel
- 22,280 canisters of DOE high-level radioactive waste (equivalent of about 11,500 MTHM)

### Inventory Module 2

- 105,000 MTHM of commercial spent nuclear fuel
- 2,500 MTHM of DOE spent nuclear fuel
- 22,280 canisters of DOE high-level radioactive waste (equivalent of about 11,500 MTHM)
- 2,000 cubic meters (72,500 cubic feet) of Greater-Than-Class-C waste
- 4,000 cubic meters (142,000 cubic feet) of Special-Performance-Assessment-Required waste

produce greater human health impacts to workers and to the public, increase energy use, create larger amounts of waste, and increase transportation impacts. Although such impacts would increase by as much as 70 percent with the emplacement of larger waste volumes, most of the impacts themselves would be small. The following paragraphs focus on occupational and public health and safety impacts related to the disposal of the additional inventories.

### Occupational and Public Health and Safety

**Impacts to Workers from Industrial Hazards.** Up to 4 fatalities under Module 1 or 2 could occur compared to about 2 to 3 during the Proposed Action prior to closure. Most of the impacts would occur during the operations phase. Industrial safety impacts for injuries, illnesses, and lost workday cases for Module 1 or 2 would be about 30 to 40 percent greater than those for the Proposed Action.

**Radiological Impacts to Workers.** Most of the total worker radiation dose would result from activities during the operations and monitoring phase. As many as approximately 5 to 8 fatalities under Module 1 or 2 could occur in the worker population, compared to approximately 4 to 7 under the Proposed Action.

**Radiological Impacts to the Public.** Radiological health impacts to the public from construction, operation and monitoring, and closure of the repository would be small. The calculated likelihood that the maximally exposed individual would experience a latent cancer fatality is about  $2.6 \times 10^{-5}$  under Module 1 or 2, compared to  $1.6 \times 10^{-5}$  for the higher-temperature repository operating mode. Impacts for the lower-temperature operating mode would range from about the same as the higher-temperature operating mode to about twice the impacts of the higher-temperature mode. However, the estimated number of latent cancer fatalities for all operating modes for the Proposed Action or the Inventory Modules would be much less than 1.

**Long-Term Radiological Impacts.** Long-term cumulative impacts (impacts after closure at the repository) to public health would occur from radionuclides ultimately from Yucca Mountain, past weapons testing on the Nevada Test Site, and past, present, and future disposal of radioactive waste on the Nevada Test Site and near Beatty, Nevada. Cumulative impacts over 10,000 years from radionuclides released to groundwater would result in about 0.0003 latent cancer fatality over 10,000 years.

### **S.7.2 OTHER FEDERAL AND NON-FEDERAL ACTIONS**

This EIS evaluates the potential cumulative impacts of other Federal and non-Federal actions. The evaluation includes activities by local governments, private citizens, the Nellis Air Force Range, the Bureau of Land Management, the National Park Service, and the Nevada Test Site. It shows that earlier underground nuclear testing potentially results in long-term cumulative impacts due to potential groundwater contamination. Using conservative assumptions, the evaluation calculated the maximum potential dose from the radionuclides from underground testing to be 0.007 millirem per year. Therefore, the maximum cumulative impact of the Proposed Action in 10,000 years [using the mean impact at 18 kilometers (11 miles) from the repository] would be 0.00002 millirem per year (potential Yucca Mountain Repository impact) plus 0.007 millirem per year (potential underground testing impact), or 0.007 millirem per year.

### **S.7.3 TRANSPORTATION**

The EIS analysis assumed the shipment of Inventory Module 1 or 2 to the repository would use the transportation routes described for the Proposed Action but would require almost twice as many shipments and an additional 14 years. This would result in increased industrial hazards, traffic fatalities, and latent cancer fatalities. For example, under the mostly legal-weight truck scenario, radiological and vehicle emission impacts from incident-free national transportation could increase from 12 to 24 occupational latent cancer fatalities, and estimated latent cancer fatalities in the general population could increase from 3 to 7 for the 38-year transportation of Inventory Module 1 or 2. Traffic-related fatalities from shipments of the modules would also be greater, increasing from 5 for the Proposed Action to 9 for Module 1 or 2. The incident-free impacts of the mostly rail scenario could be smaller because there would be fewer shipments.

National transportation of radiological materials from 1943 to 2047, not associated with the proposed repository would result in a total dose to affected transportation workers as high as 350,000 person-rem, which could result in about 140 latent cancer fatalities. These same activities would result in a total dose to the public of 340,000 person-rem, which could result in about 170 latent cancer fatalities. In addition, an estimated 97 traffic fatalities would result from the 104 years of transportation of radiological materials not associated with the Proposed Action.

The cumulative impacts to workers from transportation activities could be up to 160 or 180 latent cancer fatalities for Inventory Module 1 or 2, respectively. As many as 110 cumulative traffic fatalities would result from transporting radiological materials, including the inventory modules.

## **S.8 Cumulative Impacts of the No-Action Alternative**

DOE analyzed the cumulative impacts of the No-Action Alternative with respect to Inventory Module 1. The Department did not analyze the cumulative impacts of the No-Action Alternative with respect to Inventory Module 2 because it did not have sufficient and readily available information about the Greater-Than-Class-C and Special-Performance-Assessment-Required wastes in that module to perform a meaningful analysis. Furthermore, this information could not be obtained without an exorbitant commitment of resources. However, information was sufficient to make the determination that there would be a small incremental increase in impacts over those of Module 1.

DOE estimated that about 6,400 concrete storage modules at the 72 commercial sites and three below-grade vaults at the DOE sites would be required to store 70,000 MTHM of spent nuclear fuel and high-level radioactive waste. In comparison, an additional 4,600 concrete storage modules (11,000 total) at the commercial sites and an additional five below-grade vaults (eight total) at the DOE sites would be required to store the entire inventory of Module 1.